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VIBRATOR SEED SEPARATOR[1/]

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The separation of weed seed and their removal from crop seed and the separation of crop seed when mixed are operations generally known as seed cleaning. Seed cleaning is a complex operation requiring several types of machines. Some cleaners make separations on the basis of shape, size, length, and specific gravity of the seed; and others, on the basis of their differences in surface texture, color, or electrical properties. Nonuniformity of growth of crops and the minute size of some crop and weed seed often make the task of separations very difficult.

Weed and other crop seed mixed in with planting seed cost farmers in the United States several million dollars annually. Research engineers and scientists, both in industry and public institutions, are constantly trying to develop new equipment and techniques for better separation of seed in order to reduce this heavy monetary loss.

A new separator recently developed by ARS engineers, in cooperation with the Oregon Agricultural Experiment Station, can make some separations that are difficult or impossible to make with existing machines. A vibratory table adjustable to forward and sideways tilt promotes seed separation on the basis of their shape and surface texture. The new separator is illustrated in figures 1 and 2.

1/ Cooperative investigations between the Agricultural Engineering Research Division, Agricultural Research Service, United States Department of Agriculture, and the Oregon Agricultural Experiment Station.

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Figure 1. Vibrator seed separator removing curly dock from crimson clover. (Extra decks can be seen on the right side of separator.)

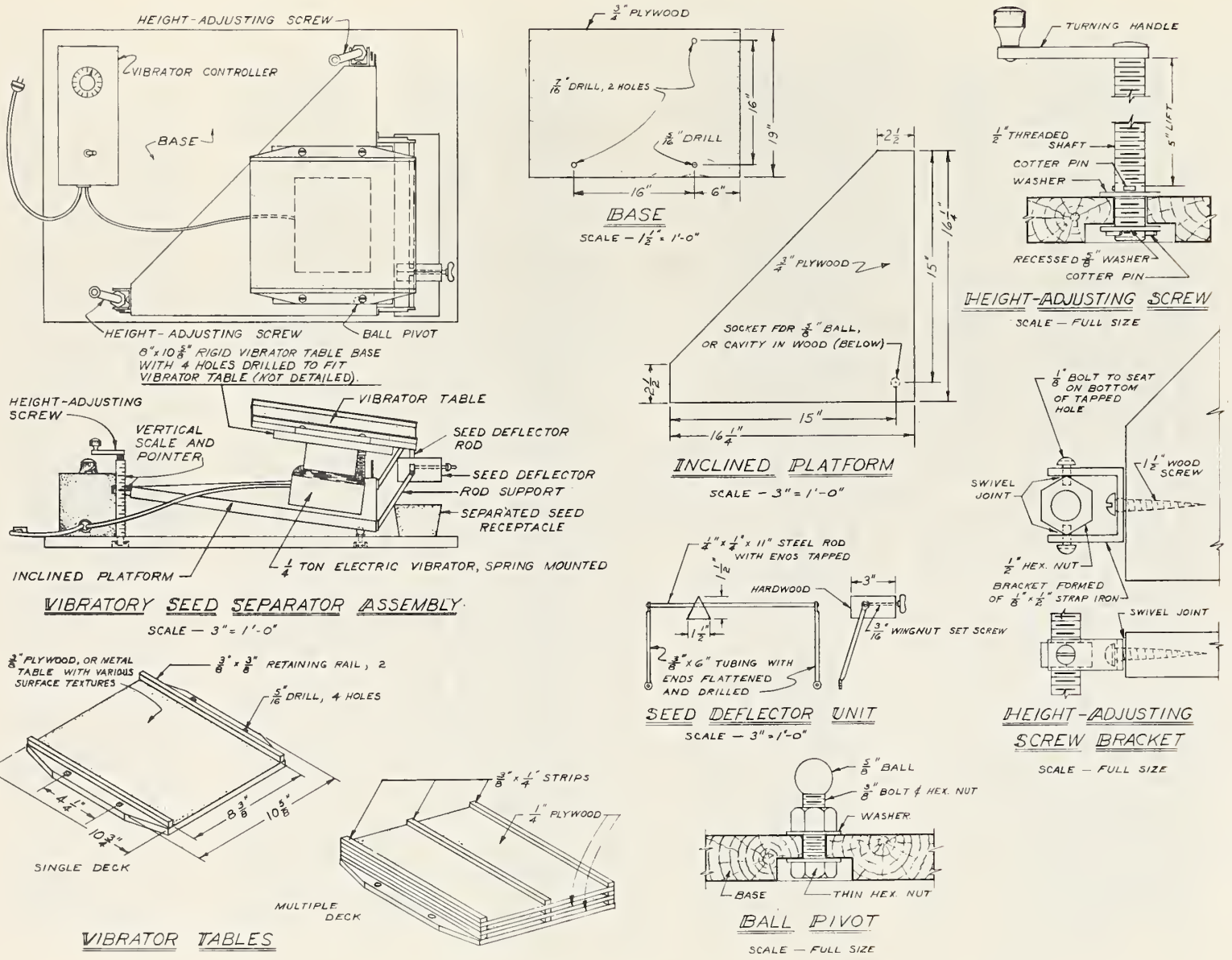

Figure 2. Detail drawing of vibrator seed separator. No. 1003-1-60.

The laboratory model of the vibrator seed separator has been used successfully to remove sweet vernal grass from ryegrass, rippleseed plantain from bentgrass, pigweed from alfalfa, curly dock from crimson clover, hulled Bermudagrass from white clover, and hedge-mustard and dog fennel from timothy. This experimental machine has considerable value as a research tool, and with modification it should be suitable for seed analysis work. Also, commercial firms have shown interest in making adaptations.

A great increase in capacity is possible either with a large table or a bank of small tables. Tables or decks used on the experimental machine are 8-3/8 inches wide and 10-3/4 inches long.

The new separator has a tilted deck, an electro-magnetic vibrator, a seed metering device, and discharge chutes. It is somewhat similar in action to the specific gravity machine which uses a vibrating deck with adjustable angle of inclination. The gravity machine uses air and requires a quantity of seed to stratify according to its buoyancy, whereas the new machine will make the separation with only two seeds. The new separator uses no air and is more sensitive to the shape and surface texture of seed than other machines.

DECKS

Decks have been fabricated for the experimental machine ranging in surface texture from that of sheet aluminum to rough sandpaper. The decks are 8-3/8 inches wide and 10-3/4 inches long.

A deck, when mounted on the cleaner, can be tilted endways and sideways to meet the requirements of the seed to be separated. The angle of inclination of the deck can be varied from 0° to 19° endways, and from 0° to 17° sideways (figure 2).

For separating crimson clover and curly dock, an endways angle of about 7° and a sideways angle of 5° are used. For ryegrass and sweet vernal grass, about the same endways angle of 7° is used, but it is necessary to change the sideways angle from 5° to 14° for a satisfactory separation.

The vibration tends to "walk" the mixture of seed sideways and uphill. However, a smooth seed will not travel as far sideways as one with a rough surface. Also, an oval-shaped seed will have a tendency to roll to the lower side of the table, whereas a flat-sided seed will slowly move up the incline. Consequently, the seed are separated largely according to their shape and surface texture, and are deflected from the back edge of the deck into separate containers.

VIBRATOR

A commercially available electro-magnetic vibrator for 110-volt, 60-cycle current is used to energize the deck on the experimental vibrator separator. It vibrates 3,600 times per minute and has an amplitude range of from 0 inch to 3/16 inch. At 0 inch amplitude there is no vibration, but the intensity of the vibration increases beyond this point to a maximum of 3/16 inch as the controller moves from low to high setting. The amplitude of the vibrator, the angles of the deck, and the surface of the deck all influence the performance of the machine in making seed separations.

FEED

Seed are fed by gravity to a container on the deck of the cleaner. The container vibrates with the deck and is equipped with an adjustable flow gate. However, if desired, a separate electro-magnetic vibrator or a mechanically operated vibrator could be used for feeding the machine.

SUMMARY

A seed cleaner that is more effective than others in making some difficult separations has been developed. It is somewhat similar in action to the specific gravity machine that uses a vibrating deck with adjustable angle of incline. The gravity cleaner, however, uses air and requires a quantity of seed to stratify according to its buoyancy, whereas the new machine will make the separation with only two seeds. The new separator uses no air and is more sensitive to the shape and surface texture of seed than other machines.

The vibrator seed separator has great value as a research tool because of its precision of separations. With some modifications it should also be suitable for laboratory seed analysis work. Commercial adaptions are promising. The experimental machine uses one deck 8-3/8 inches wide and 10-3/4 inches long. A great increase in capacity is possible either with a large table or a bank of small tables.